

# San Francisco Bay Conservation and Development Commission

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**TO:** All Engineering Criteria Review Board Members

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**SUBJECT: Brooklyn Basin Project 2<sup>nd</sup> Review Meeting (BCDC Permit No. 2006.007.01)**  
(For Board consideration on August 11, 2015)

## Project Summary

**Project Name.** Brooklyn Basin Project

**Applicant.** Signature Development

**Project Representatives.** Patrick Van Ness, Eric Harrison

**Presenters:** Dilip Trivedi, P.E. (Moffatt & Nichol), Jeff Fippin, G.E. (ENGEO).

**Project Background.** The Brooklyn Basin Development project involves the construction of 3,100 housing units, 200,000 square feet of retail/commercial space, and various parks and public access improvements along the Oakland Estuary. Work in the Bay includes the retrofit of the 1,200-foot-long by 225-foot-wide Ninth Avenue Terminal wharf, the removal of an existing marina at Clinton Basin and replacement with a pile-supported boardwalk and a sheet pile wall to support backfill to create Gateway Park, and the removal of a derelict wharf at the Shoreline Park-West Bulkhead Wall. The shed over the wharf is currently used for storing cotton, and the inboard side of the wharf is a truck loading area. As part of the Brooklyn Basin Development Plan, most of the wharf will be converted to public park space by removing the majority of the shed. An approximately 20,000-square-foot portion of the shed will be retained and used as a community center. The proposed park space will include a promenade along the water's edge (Clinton Basin and Shoreline Park-West Bulkhead Wall). All components of the project are located in Oakland, California.

The Wharf structure has an estimated life expectancy of approximately 50 years and the non-structure elements have a life-expectancy of over 100 years.

**February 26, 2015 Review by the Engineering Criteria Review Board (ECRB).** The project was authorized by BCDC Permit No. 2006.07.01. This review is conducted pursuant to the requirements of Special Condition II.A.1.a, requiring ECRB review of preliminary plans and engineering criteria. The ECRB originally reviewed the project on February 26, 2015. The following comments were made at that meeting:

1. Mr. Rollo asked questions regarding the sheet pile wall, including whether, in designing its engineering criteria the engineering team considered any future dredging that may affect the profile of the Bay bottom.

2. A request for a thorough site response analysis.
3. Request for better estimates and precise locations of project components within the BCDC's 100-foot shoreline band and structures in and over the Bay.
4. Estimates of the Bay fill quantities.
5. Impacts on the Bay from potential failures of the retaining structures (including sheet pile walls).

In addition, at the February 26, 2015 meeting, there was discussion regarding Bay mud strengths and on-shore (active and passive strengths and dynamic seismic increments) with respect to the sheet pile wall analysis, impact of design at the "deadman" areas at the basin and dynamic site characterization. Although the Board was in general agreement with the proposal, it requested that the applicant address all of the issues and inquiries raised at the first meeting, ranging from selection parameters and design philosophy to methodology. Please refer to February 26, 2015 minutes for further details.

At the meeting, a request by the Board was made to provide a seismic instrumentation plan for the project.

*The applicant has provided direct responses to the Board's questions in the report entitled "Brooklyn Basin, Phase 1, 9<sup>th</sup> Avenue Terminal Wharf, Seismic Retrofit" by ENGEO, dated July 2, 2015, as revised through July 15, 2015.*

**Project Material Submittal Summary.** The project has three components that include the areas known as the Ninth Avenue Terminal Wharf, Clinton Basin, and the Shoreline Park–West Bulkhead Wall.

1. **The Wharf (Phase 1).** The structure is divided into four sections for seismic evaluation. In the new development plan, three-quarters of the existing shed structure will be removed and replaced with a timber deck and walkways. A 20,000-square-foot section of the shed structure will be retained and modified for public use.



FIGURE 1-1: WHARF SECTION DESIGNATIONS

The wharf structure dates to the 1930s is comprised mostly of reinforced concrete deck, except for the last 20 feet bayward, which is wood. The support structure consists of timber and concrete pilings on the inland and bayward sides of a rock dike, respectively. From field surveys, it is assumed that the rock dike was placed prior to the piles and that no piles were driven through the rock dike. The last 20 feet of timber deck are supported by timber piles. This 20-foot section of timber deck and pilings will be removed. The rock dike was placed to retain dredged fill. The water side of the dike was dredged to form an underwater slope extending to the berth dredge depth of -36 feet MLLW. For further information on the historical use, please see Brooklyn Basin Seismic Slope Stability Report, attached. An assessment of potential rock dike displacement and a strategy to limit the potential displacement is included in the material.

A recent structural inspection and material testing program was completed in 2015. Measures to strengthen deteriorated piles include concrete jacketing, cast-in-place concrete encasement for bottom concrete pile jackets that are deteriorated, as well as carbon fiber reinforced plastic wrapping around piles and patching of deck spalls.

According to the technical team's reports, in order to verify the seismic performance of the structure, the team did a structural assessment, seismic performance evaluations and retrofit design, seismic stability analysis, including the potential displacement of the rock dike, and a proposal of a design wall in certain areas of the wharf to limit the lateral movement of the dike. The global strategy is to keep the wharf structure's criteria within the Level 2 seismic performance limits.

As per the geotechnical report, wherever the existing wharf does not meet the seismic performance criteria, seismic retrofit design for the upgrade of the structure would be based in compliance with CBC Chapter 31F (MOTEMS). Based on the team's seismic performance evaluation, some sections of the wharf would not require seismic retrofit. These areas include sections A-A' and C-C'. On the other hand, sections B-B' and D-D' would be designed on the water side of the rock dike with a toewall consisting of sheet piles or combi-walls connected to king piles that would extend to the wharf deck via concrete pile cap at section D-D'.

Further, ENGEO has provided a Seismic Slope Stability Report as a response to some of the ECRB requested contingencies of February 26, 2015. Earth Mechanics, Inc., the team's internal geotechnical peer reviewer, and Simpson Gumpertz and Geger (SGH) have reviewed the scope of work to confirm the approach in relation to general accepted standards used in marine geotechnical engineering in California.

The existing shoreline grades will be raised to meet the planned roadway surfaces. In addition, underground utilities and a storm drain outfall structure are planned for areas of the Shoreline Park southeast of the intersection of Clinton Lane and the Ninth Avenue Wharf. Therefore, the site required settlement analysis and mitigation. Prior to mailing, the applicant provided revised onsite settlement mitigation and pavement recommendations. To address differential settlement issues, the team recommends

using cellular concrete within the streets before constructing waterlines and joint trench crossings and the installation of utilities. Further, soil surcharging of the sidewalk areas is being proposed.

2. **Clinton Basin (Phase 2).** As previously reviewed on February 26, 2015, Clinton Basin is the Phase 2 component of the Brooklyn Basin project and consists of a boardwalk along the northwest and southeastern shores and a bulkhead wall along the northeastern end of the basin.

The bulkhead wall will be constructed and located approximately 150 feet south of the northeastern end of the basin where fill will be placed behind it to create additional land for a park and open space. The perimeter boardwalk will be supported on prestressed, driven concrete piles with an end-wall constructed along the landside of the boardwalk.

A geotechnical report titled "Clinton Basin Improvements" by ENGEO and dated January 19, 2015 includes the following scope of work.

- a. Collection of available published subsurface data.
- b. Performance of additional subsurface investigation to determine the soil type and strength characteristics along the perimeter and within Clinton Basin.
- c. Development of project-specific seismic design parameters.
- d. Evaluation of shoreline slope stability under seismic loading.
- e. Development of values for pile-foundation soil resistance to lateral loads.
- f. Development of wall pressures for the proposed bulkhead wall.
- g. Development of recommendations to address identified slope stability deficiencies.

**Updated Bulkhead Concept.** Please note that the previous *tie-back wall with "deadman"* proposal has been replaced with a proposal for a concrete gravity wall bulkhead, following dredging of the soil deposits at the end of the basin. In addressing the bulkhead, the report includes an analysis of seismic slope stability, an evaluation of the sliding of the wall during seismic events and construction recommendations that include non-structural sheet pile walls used as cofferdams for dewatering the area behind the concrete wall, and dredging of recent bay deposits below the proposed bulkhead.

The updates of the boardwalk stability calculations includes consideration of the recent bay deposits assumed to infill the basin, development of pseudostatic coefficient using National Cooperative Highway Research Program, 2008, NCHRP Report 611, and consideration of effects of potential future dredging on slopes.

3. **Project's Seismic Instrumentation Program Proposal.** The technical team does not recommend free-field instrumentation at the project site based on the number of instrumentation in the area that documents and monitors soft-ground sites in the vicinity. Instead, it proposes an instrumentation plan that includes accelerometers that collect shaking information in two perpendicular horizontal and vertical planes, tilt

meters, and survey points. The proposal is to locate the accelerometers and tilt meters at the existing Ninth Avenue Wharf, in one of each instrument at the boardwalk along Clinton Basin and at bulkhead wall at Clinton Basin.

4. **Sea Level Rise.** The Moffatt & Nichol February 11, 2015 Memo, attached, indicates that the project consists of two flood protection components: a perimeter protection component along the shoreline and the interior grades. The shoreline edge is proposed to be three feet above the current 100-year water level, which, according to the team, would address the SLR effects beyond mid-century levels. For the interior grades, the development plan proposes a minimum Finish Flood elevation of structures to be 12.3 feet NAVD88 (three feet above the current 100-year water level) to account for SLR in the future. The proposed shoreline edge elevation would be 11.65 feet NAVD that according to the team would be high enough to prevent overtopping by extreme waves.

**Law and Policy Considerations.** The *McAteer-Petris Act* allows the Commission to approve fill<sup>1</sup> only when public benefits from fill clearly exceed public detriment from the loss of the water areas and should be limited to water-oriented uses (Section 66605).

Further, fill shall meet certain specific criteria, including that the fill be constructed "in accordance with sound safety standards which will afford reasonable protection to persons and property against the hazards of unstable geologic or soil conditions or of flood or storm waters" (Section 66605(e)) and that the fill should be the "minimum necessary to achieve the purpose of the fill" (Section 66605(c)).

Within the Commission's 100-foot shoreline band, the Commission can only deny a project if it fails to provide the "maximum feasible public access consistent with the project" (Section 66632.4).

Additionally, in order to carry out its responsibility, the San Francisco Bay Plan includes policies regarding the safety of fills and climate change.

#### **San Francisco Bay Plan Policies Regarding the Safety of Fills**

1. Policy No. 1 states, in part, that the Commission has appointed and empowered the ECRB to:
  - “(a) establish and revise safety criteria for Bay fills and structures thereon; and
  - (b) review all except minor projects for the adequacy of their specific safety provisions, and make recommendations concerning these provisions...”
2. Policy No. 2 states, in part, that “even if the Bay Plan indicates that a fill may be permissible, no fill or building should be constructed if hazards cannot be overcome adequately for the intended use in accordance with the criteria prescribed by the ECRB.”

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<sup>1</sup> Fill is defined in the McAteer-Petris Act as "earth or any other substance or material, including pilings or structures placed on pilings, and structures floating at some or all times and moored for extended periods, such as houseboats and floating docks" (Section 66632(a)).

3. Policy No. 3 states, in part, that “to provide vitally-needed information on the effects of earthquakes on all kinds of soils, installation of strong-motion seismographs should be required on all future major land fills. In addition, the Commission encourages installation of strong-motion seismographs in other developments on problem soils, and in other areas recommended by the U. S. Geological Survey, for purposes of data comparison and evaluation.”
4. Policy No. 4 states, in part, that “[a]dequate measures should be provided to prevent damage from sea level rise and storm activity that may occur on fill or near the shoreline over the expected life of a project. The Commission may approve fill that is needed to provide flood protection for existing projects and uses. New projects on fill or near the shoreline should either be:
  - [a] set back from the edge of the shore so that the project will not be subject to dynamic wave energy,
  - [b] be built so the bottom floor level of structures will be above a 100-year flood elevation that takes future sea level rise into account for the expected life of the project,
  - [c] be specifically designed to tolerate periodic flooding, or
  - [d] employ other effective means of addressing the impacts of future SLR and storm activity.”

#### **San Francisco Bay Plan on Climate Change**

1. Policy No. 2 states, in part, that “When planning shoreline areas or designing larger shoreline projects, a risk assessment should be prepared by a qualified engineer and should be based on the estimated 100-year flood elevation that takes into account the best estimates of future sea level rise and current flood protection and planned flood protection that will be funded and constructed when needed to provide protection for the proposed project or shoreline area. A range of sea level rise projections for mid-century and end of century based on the best scientific data available should be used in the risk assessment. Inundation maps used for the risk assessment should be prepared under the direction of a qualified engineer. The risk assessment should identify all types of potential flooding, degrees of uncertainty, consequences of defense failure, and risks to existing habitat from proposed flood protection devices.”
2. Policy No. 3 states, in part, that “to protect public safety and ecosystem services, within areas that a risk assessment determines are vulnerable to future shoreline flooding that threatens public safety, all projects should be designed to be resilient to a mid-century sea level rise projection. If it is likely the project will remain in place longer than mid-century, an adaptive management plan should be developed to address the long-term impacts that will arise based on a risk assessment using the best available science-based projection for sea level rise at the end of the century.”

**BCDC's Request for Technical Advice.** BCDC seeks the Board's advice with respect to the proposed project and BCDC's law and policies:

**1. Seismic, Structural and Geotechnical Concerns**

- a. **Ninth Avenue Wharf.** The technical information includes slope stability and seismic performance evaluations, analysis and retrofit design including the toewall/piles-to-deck design to restrain the rock dike. The structure will be used as a public open space, a community center and commercial purposes.

Based on the information, the Board's advice is sought on whether the proposed overall safety retrofit strategy for the ninth avenue wharf is reasonable and adequate given the proposed use and the potential for movement of the existing rock dike during a seismic event.

- b. **Clinton Basin Bulkhead.** The revised engineering approach for the construction of the park and open space includes a gravity wall bulkhead in lieu of a previously proposed tie-back wall with "deadman". The technical information includes estimated slope performance around the wall during a seismic event.

The Board's advice is sought on whether the bulkhead has been designed to take into account all potential physical hazards.

- c. **Clinton Basin Boardwalk.** The proposal includes the use of 24-inch octagonal prestressed concrete piles to support the structure. The report indicates that some areas of the boardwalk such as the "South 2" area could be subjected to downdrag effects on the piles (soil movement downward relative to pile) due to the anticipated settlement of the underlying soft young bay mud deposits of the proposed fill.

Based on the analysis of the design capacity of the piles, the Board's advice is sought on whether the proposed criteria addresses structural and overall safety concerns with respect to the potential soil hazards and physical conditions of the site.

A revised geotechnical report regarding onsite settlement mitigation indicates that areas of the project inland of the shoreline would have to be mitigated for settlement due to the compressibility of the Young Bay Muds onsite.

The Board's advice is sought on whether these settlement mitigation strategies affect the stability of the existing wharf or the boardwalk piles from surcharging effects during the time of the construction?

- d. **Seismic Instrumentation Plan Proposal.** The seismic instrumentation plan has yet to be reviewed and discussed by the California Strong Motion Instrumentation Program (SMIP). However, the team has proposed the use of accelerometers and tilt meters in the structural components of the project such as the wharf, the boardwalk and the basin bulkhead.

The Board's advice is sought on the adequacy of the proposed seismic instrumentation plan.

## 2. Sea Level Rise and Flooding

- a. The February 11, 2015 Memo, prepared by Moffatt & Nichol, indicates that the structures, the wharf, the boardwalk and adjacent inland areas would have sufficient flood clearance capacity for the life of the project. The finish floor elevation of the boardwalk would be 12.3 feet and the wharf's deck would be 13.5 and 14 feet NAVD, three and four feet above current BFE (Base Flood Elevation), respectively. The proposed shoreline edge elevation and top of bulkhead would be 11.65 feet NAVD (29 inches above BFE). The current 100-year return period water level for the site based on FEMA Flooding Insurance Rate Maps (FIRMs) is 9.27 feet NAVD. Based on the National Research Council's 2012 SLR information, the proposed structures could be flood-resilient to a medium-level end-of-century SLR projection of 36 inches. By contrast, SLR projections for year 2100 range from 17 inches (low end) to 66 inches (high estimate), respectively. The shoreline edge would be designed to a +50-year (year 2070) water-level projection that could be adapted to higher levels of flood by way of increases in grade level. Based on the information provided, the board's advice is sought on the following:

- (1) The top of the bulkhead (gravity wall design) would be part of the shoreline edge, and has been designed for expected water levels to year 2070. Has the structure been designed to be resilient to periodic flooding? Has the structure been designed so it can be raised when water levels exceed those projected for 2070? If overtopping occurs, would the loading effects of the additional water behind the wall be significant enough to potentially damage the structure and its public access uses?
- (2) Are the proposed flood resilience and design strategies proposed for all the structures, including the bulkhead wall, reasonably sufficient and adequate to prevent damage of the structures over their expected design life (year 2070 and beyond)?

### Enclosed Material

1. Signature Development Group. Structural Assessment and Seismic Retrofit of 9<sup>th</sup> Avenue Wharf at Brooklyn Basin, 15 July 2015/SGH Project 157526.00 prepared by Simpson Gumpertz & Heger.
2. Existing Geotechnical Conditions and Seismic Slope Stability/Brooklyn, Phase 1/9<sup>th</sup> Avenue Terminal Wharf Seismic Retrofit, Oakland, California prepared by ENGEO, Inc. July 2, 2015/Revised July 15, 2015.
3. Clinton Basin Improvements Geotechnical Report/Brooklyn Basin, Phase 2, Oakland, California prepared by ENGEO, Inc., January 19, 2015. To view this report, please go to the link <http://ftp.bcdc.ca.gov/> under filename Brooklyn Basin.



4. ENGEO July 2, 2015 Memo re: Clinton Basin Updated Recommendations. To view this report, please go to the link <http://ftp.bcdc.ca.gov/> under filename Brooklyn Basin.
5. ENGEO July 15, 2015 Memo re: Shoreline Structure Instrumentation Program.
6. February 11, 2015 Memorandum to Patrick Van Ness of Signature Development re: Vulnerability to Sea Level Rise Brooklyn Basin Development.